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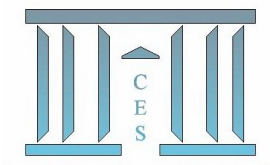
CES Working Papers



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2014.53

Maison des Sciences Économiques, 106-112 boulevard de L'Hôpital, 75647 Paris Cedex 13
http://centredeconomiesorbonne.univ-paris1.fr/
ISSN : 1955-611X

Are autographs integrating the global art market? The case of hedonic prices for French autographs (1960-2005)[1]

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February 2014

Abstract

The market for autographs has become more open to international buyers since 1990. Our data set features a large sample of store and auction sales for selected authors every five years from 1960 to 2005. The estimation of a hedonic price function shows that page count, type of author, date and type of the document, together with consumer and assets price indices explain more than one half of the price differences. Authors who are more often sold at auctions (hence more likely to attract international demand) carry a 28% premium when sold in stores. The autographs (real) price increased by 222% during the period, while the hedonic price increased by 190%. With growing correlation between French autograph prices and art market index, as well as a supply function responsive to market valuation and trends, the French autograph market has become more integrated in the global art market since the 1990's.

Keywords: Autographs, Hedonic prices, Hedonic price function, Globalization
JEL Classification: B41, C13, C32, D46, Z10, Z11

Titre en français : Le marché des autographes est-il global ? : Une illustration à l'aide de l'évolution des prix hédoniques dans le cas de la France

Résumé

Le marché des autographes est comme bien des marchés de biens culturels en voie de globalisation accélérée. Il est alors intéressant de voir comment cela se manifeste, l'hypothèse implicite étant alors que les prix devraient augmenter sensiblement avec l'ouverture internationale du marché. L'article part donc d'un recensement de ces prix sur la période 1960-2005, recensement qui a débouché sur le première base de données de ce type dans le cas de la France et confronte l 'augmentation réelle des prix à celle qui résulte de l'augmentation des prix hédoniques. L'estimation du modèle repose ici sur la distinction des manuscrits en fonction de leur auteur, de leur genre et du nombre de pages. : on constate alors une différence positive de + 28%, essentiellement sur la période 1990-2005, justement celle où l'on constate l'internationalisation des maisons de ventes et des processus d'enchères. La globalisation semble donc bien vérifiée et devenir ainsi une caractéristique essentielle du marché des autographes en France.

Mots clés : Autographes, prix hédoniques, fonction de prix hédonique, globalisation

Classification JEL : B41, C13, C32, D46, Z10, Z11

[1] Thanks are due to Christophe Starzec for his help in the preparation of the dataset.
[2] Some of the sellers often work as expert witness or judicial experts. Such feature denotes an obvious expertise.

0. Introduction

Autographs are documents handwritten by a well known celebrity. It can contain only a signature, or a text written by the author of the signature. Relevant categories of celebrities are TV or music stars (see e. g. Collins, Doherty, Snell (2006)) or historical figures, artists, scientists, etc. (see below, §2 description of the database). Documents under consideration are public records, letters, notes, etc. of variable length. They can be bought from specialized sellers or from auctions.

Such market for ancient goods is usually considered as a form of art market or cultural heritage market. Autographs generally do not have any functional utility, even if they have had some in the past. They value is then entirely cognitive, symbolic or emotional. Beyond their material form, they convey an immaterial heritage, which makes them part of the world of art. Hence, their value cannot be determined *a priori* from their utility, which would objectively define economic dimensions and evolution: while their current value is grounded in historical references, their future value remains very uncertain. Consequently, a buyer with a strong subjective valuation of an autograph is lacking the rationale to determine the level of financial resources one can invest in it.

The evolution of autographs valuation in time should then be enlightened. First, the variability of prices over time may depend on changes in the quality of autographs, so that the trend of the hedonic price, which is the normal price for an item defined by a given vector of characteristics, is a better statistics to measure the financial return of autographs.

Two aspects of the problem at hand must be taken into account;

- the coexistence of two market segments with parallel mechanisms of price formation (stores and auctions),
- the existence of substitutes on closely related markets (fine prints, ancient books, objets d'art).

This latter feature leads to an objectification of value, which can be related to economic quantities. Running an hedonic prices approach (§3) on our database of autographs prices in France from 1960 to 2005, we find that the value of autographs is very sensitive to the relative nature of the signer of the document, while other factors seem of lesser significance. We then try to assess the market responsiveness to a quality signal. An analysis of the residual shows (§4) that the supply is reacting to valuation above expected price: this phenomenon is interpreted as responsiveness to quality signalling. Together with the integration of both auctions and stores market segments, this phenomenon shows a tendency toward global integration. Let us begin by introducing the theoretical aspects of our matter

1. Rationale

Wyburn and Roach (2012) examine the prices of American comic-books and obtain very good estimates of that price, explaining 87% of the variance. They stress the importance of path dependency of prices, which depends on the provenance of the comic book (for instance if it was owned by a well known collector) and on some price dynamicsin the market. For instance, the bubble which characterized this market in the mid-1990 increased more the

price in lower grades (perhaps because high grades become soon very scarce during a bubble), which caused a rapid decrease of their price during the period of correction. This path dependency could be taken into account by dynamic specification whenever a panel would be available, but such a panel data necessitates the occurrence of at least two entries of the product on the market during the period of observation, which is not the case in our dataset.

Wyburn and Roach also stress an interesting element of the comic book market where there exist for some products a high desirability outside of the community of collectors and speculators. In the autograph market, putsiders are likely to buy from stores, but not at auctions: different proportion of speculators or collectors on the two segments, or the presence in stores of uncommon buyers may account for the discrepancy between prices on these two segments of the market.

Georges and Seçkin (2012) estimate a hedonic price for classical music manuscripts. They provide interesting conclusions related to the average return on that market and the high risk of collecting and investing in music manuscripts

Two elements must be taken into account to understand how the market for autographs works and explain valuation mechanisms.First, the market includes two segments: autographs sellers, and auctions. It seems unlikely that these segments diverge for a long time; on the contrary a noticeable trend on a segment should not be long to come to the other. This seems obvious if the market participants are the same and behave in the same way on both segments. However, if the market participants tend to be different on both segments, this change will probably affect both the behaviour and working of the segments and the whole market in a rather complex way. These assumptions deserve careful examination, as it seems to have happened recently in France:

- Since its origin in the mid-nineteenth century, the French market for autograph has been considered an over-the-counter market, with auctions playing only a very limited role. 600 sellers are listed, with less than twenty true specialists among them[2]. Buyers are mostly experienced collectors, with some occasional buyers and state representatives. The former complement a collection according to a systematic (if not rational) plan, the latter do the same for the public institutions holding such type of documents; occasional buyers are those who buy impulsively and rarely.
- Auction is the most unstable segment of the market with 482 selling places, with a few of them being really active[3]. Two other classes of buyers appear in this context: first merchants themselves, looking for new goods to fill the shelves of their stores, then the so-called "speculators". By "speculator" we mean someone concerned with the market value, not the intrinsic value of the autographs. This market segment has been

[2] Some of the sellers often work as expert witness or judicial experts. Such feature denotes an obvious expertise. There are: A Saint Benoît des Prés, Arts et autographes, Autographes Demarest, Galerie Frédéric Castaing, L'Abbaye Librairie Jacques-Henri Pinault, La Palourde Librairie Jean-Yves Lacroix, Les Argonautes, Les Autographes Thierry Bodin, Les Neuf Muses Alain Nicolas, Librairie ancienne Coulet et Faure, Librairie Gaston Saffroy, Librairie Henri Vignes, Librairie Historique Clavreuil Fabrice Teissèdre, Librairie Jean-François Fourcade, Librairie Loliée, Librairie Michel Bouvier, Librairie Sourget.

[3] Although no quantitative study of the market could back a definite list of "auction houses actively selling autographs", the following are famous among connoisseurs: Aguttes, Alde, Artcurial, Christie's, Drouot, Gros et Delettrez, Piasa, Pierre Bergé&associés, Rossini, Sotheby's, Tajan. A more extensive list is give in Miranda Mendoza [2010] pp. 68 sqq.

regulated for a long time by state intervention, via the Archives Nationales(being the most prominent public buyer). The Archives Nationalesexerted a pre-emptive right on auctions and bought documents as soon as they offered a price superior to the seller's reservation price.

Since the 90's, things have changed. Professionals often agree that the number of "non-traditional" market participants has risen[4]. These "speculators" are concerned with return on investment and tax reductions; they are increasingly represented by mutual funds. Their presence at auctions seems to have changed the operating mechanism on this segment, then on the whole market. This story has to be examined, in order to test whether the market change is the product of a gradual change of the market participants and their relative importance.

Second, the market for autographs, although it has been considered for a long time as a remote market, housing mainly specialists, is no longer disconnected from the economic environment. Environment is first a linkage between the autograph market and other specific markets, such as art market. If the link is strong enough, the autograph market should react to signal from other markets: a boom on impressionist painting will most likely initiate an imitation effect on autographs. Autographs can then be perceived as substitutes for artworks, one would rather say, as surrogates.

The economic situation is then another part of environment, although it can lead to conflicting conclusions. For instance, a slowdown in growth should alter the amount invested in superior goods such as autographs. On the other hand, one can think it convenient to diversify his risk in front of uncertainty: then why not invest in assets which appear stable enough in time, such as letters and autographs? Both environmental elements concur to make the price of autographs more sensitive to contingencies outside of their market, not just to supply and demand of autographs. On the other hand, the price now features a speculative part, connected to a traditionally appealing question for observers of the art market: which factors satisfactorily explain the rise in prices one agrees to pay?

In the last twenty years, a vast majority of studies about art market – mainly about paintings – have been concerned with the following question: how will the price of a given work, which must at first reflect the state and condition of its production, evolve in the future? Should we consider price rise as steady? It seems unlikely that the bubble surrounding one peculiar type of artwork could foster and support a purely economic bubble. Even if a given set of works could – from a purely economic point of view – experience continuously rising prices (especially in connection with speculative behavior), such rise could not hold for artistic reasons. It must be recalled here that the works of art follow a so-called "convention of originality": an artist would express himself only to surpass past references. This being given, artistic values cannot grow indefinitely because of emerging new values that minimize the existing ones. The only everlasting art bubble would be kitsch, just because it results from fashion and copying, both opposed to the convention of originality. It seems difficult to relate

[4]Aristophil was the pionneer of these new kind of mutual funds, he was followed by Artecosa / Librairie Signatures, among others.

autographs to the convention of originality, though. One can but think of it metaphorically: as new autographs appear, they drain some of the demand and reduce by the same amount the stock available to buy other autographs.

The question about factors explaining price deserves a more thorough answer, especially by being developed into more specific issues. Is there any factor of adjustment bringing returns over art and financial assets to symmetry? Should we expect from the holding of an artwork the same return as from a financial asset? Or is there any systematic difference? Economic analysis of art market brought incomplete answers so far. The main features of such answers are:

- returns on artworks have been for a long time inferior to their financial counterparts. They tended to level up during the last period (1950-2000), as show by Frey and Pommerehne (1989), then Chanel*et al.*;
- the same studies have shown that the optimal holding time for art works, or at least the holding time necessary not to lose money, is about twenty years, which is far more than the mean holding time of financial assets. This duration seem to result from both very high transaction costs and the time for prices to come to some stability.
- prices of contemporary works are usually impacted by indirect events such as prizes and awards obtained by an artist or exhibitions in significant places (Moureau*et al.*, Pflieger)[5];
- from a more general point of view, the farther from their point of origin we consider the works of art, the lesser the impact of objective values and the greater that of subjective values. Contrary to the Marshallian price theory, the price is driven by objective factors such as cost of production in the short period, while in the longer period it evolve with more subjective factors such as rarity[6].

Such an inquiry deserves to be localized to take into account specific features of the autograph market. This leads to more specific questions:

- Is the price sensitive to the nature of the signer? The database features four categories: artists, historical figures, scientists and writers. If such categories are to play a significant role, it must be logically related to some intrinsic elements, or if extrinsic, to the division of time in periods.
- Is the price sensitive to the oldness? Generally speaking, it is the case for work of art which have survived so far, although the age premium might differ for various reasons.
- Is the price sensitive to the length of autographs (*i. e.* page count) or to their type (autographed letter, signed letter, apostil, etc.)? Some cases (such as large autograph manuscripts) carry an obvious premium, but the signature is crucial. Once the

[5] Such events also impact the price of older pieces through "jubilee effect" (see e. g. Miranda Mendoza [2010], Nicolas [1988]). Unfortunately, "events" are not limited to birth and death: the bicentennial of the French Revolution boosted demand for collectibles of Louis XVI and Marie-Antoinette, for instance, as the jubilees of *Madame Bovary* and *Fleurs du Mal* trials impacted the prices of Flaubert's and Baudelaire's memorabilia. As it is thus impossible to take into account all the meaningful events, we leave aside this "jubilee effect".

[6] There is no way to objectively measure rarity with our database. Rarity of an author cannot be addressed directly because our database only features sales on the French market (while demand can be global), but popularity can be a proxy for local/global demand (see below). Rarity of a given autograph cannot even be measured in our sample, although it is obvious that the earliest mention of $E=MC^2$ by Einstein – if proven – would be worth far more than a note to his cleaning lady asking her to care for the bathroom.

signature and authenticity is taken into account, length or type certainly impact the value.

Although all these questions should be asked for themselves, the answer might depend on the market segment under consideration. Even if both segments are supposed to converge asymptotically, long-lasting divergences can remain. It should then be decided whether the cause lies with the nature of the cultural goods at hand, or with the nature of the market participants.

2. Description of the data

With more than thousand dealers and auction houses it seems impossible to track every sale of an autograph on the French market. As the overall turnover remains unknown, we cannot build a representative sample in the usual sense: *i.e.* with given proportions of different classes of given descriptive variables. We had then to choose a method that could bear a significant result at affordable cost. As the *Archives Nationales* featured a rich set of catalogues of both reseller stores and auction houses, we decided to choose a set of persons representing the French history and culture and hunt down all their autographs on sale in the catalogues found at the *Archives Nationales*. 101 figures were thus selected, ranging from early sixteenth-century to the 1960's, featuring artists, writers, scientists and people of historical significance (politicians, kings, and their mistresses). The early authors where overweighed in the sample in order to account for their rarity in sales. The following table shows a breakdown of both authors and autograph prices per historical period and author type.There is no indication in our dataset of the quality of the autograph, measured for instance for comic books by a grade ("mint, near mint", see Wyburn and Roach, 2012).

Table 1
Distribution of data over time

	Before 1800 16th c./17th/18th	1800- 1902	After 1902
Authors	48% 5% / 11% / 32%	25%	28%
Autographs	25% 3% / 4% / 18%	55%	20%

'Before 1800' in broken down in three categories corresponding to centuries: sixteenth, seventeenth and eighteenth.

Table 2
Distribution of data accordingto the author type

	Artists	Historical Figures	Scientists	Writers
Authors	18%	48%	11%	23%
Autographs	14%	51%	5%	30%

The number of "historical figures" might seem too high: the problem is that many of them belong to eons and thus bring only a few autographs, while some (such as Napoleon who produced more than 513 documents priced in the database) generate a large turnover.
The authors in the sample were then thoroughly surveyed in the catalogues of the *Archives Nationales*. For every year multiple of 5 (from 1960 on, hence 1960, 1965, 1970, 1975, 1980, 1985, 1990, 1995, 2000, 2005), every price of every autograph on sale was written into the database. This brings 3,016 observations for the store market segment, and 1,608 for the auctions. 500 types of document are unambiguously described (approximately 5 for every one of the 100 authors), hence the number of transaction is significant. Eventually, the figures show that most type of classical French autograph was both identified by our sample and priced in the database. Hence, while not being *representative* from a statistical point of view (because we do not know what is to be represented), at least our database *represented* the market for French autographs.

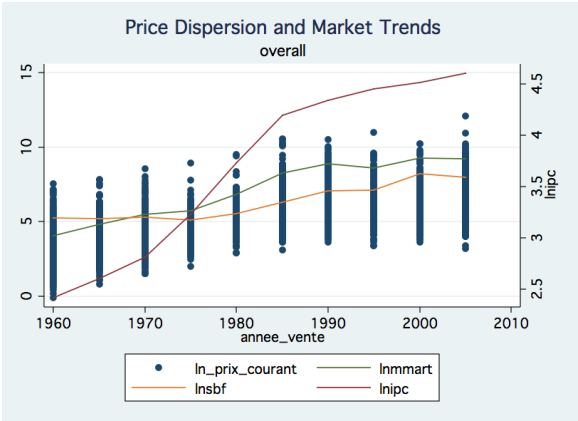
The next table summarizes for every period and every type of author the mean and standard deviation of prices in our database as well as the number of observations. A quick look seems to contradict the usual idea of price growing with antiquity of an autograph (which seems only true for scientists). This apparent paradox deserves a more careful examination.

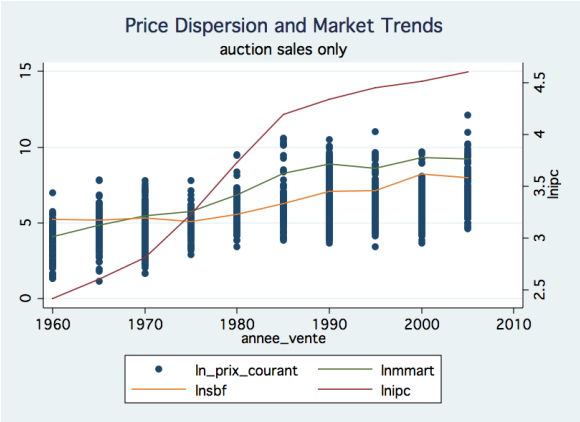
Table 3 Descriptive statistics

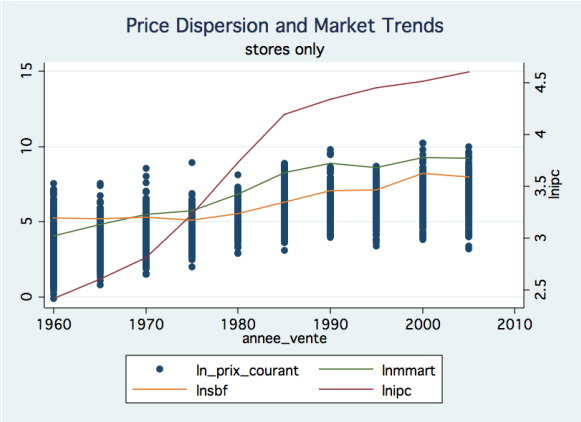
	Author / century	Artist	Historical Figure	Writer	Scientist	Total
16th c.	meanprice	.	1032.87	.	.	1032.87
	s.d.	.	1152.99	.	.	1152.99
	nb obs	0	160	0	0	160
17th c.	meanprice	.	1245.65	4051.29	19505	1994.38
	s.d.	.	2048.87	5413.81		3590.39
	nb obs	0	158	49	1	208
18th c.	meanprice	.	1167.56	5187.93	643.80	1704.15
	s.d.	.	2545.53	17801.15	535.93	7218.59
	nb obs	0	586	107	55	748
19th c.	meanprice	1393.34	798.67	1431.26	1222.44	1127.19
	s.d.	2536.46	2316.72	4437.71	1424.34	3294.28
	nb obs	225	1075	915	158	2373
20th c.	meanprice	977.59	1516.17	1854.36	1859.99	1369.69
	s.d.	1879.28	5401.71	4604.07	1613.88	3824.65
	nb obs	378	181	242	9	810
Total	meanprice	1132.72	1008.92	1913.16	1187.44	1311.72
	s.d.	2155.49	2704.82	6744.99	1789.5	4305.90
	nb obs	603	2160	1313	223	4299

If we look at the prices diachronically, there is a clear rising trend. Next graphics shows both a scatter diagram of prices and some possible deflators: France CPI, the Mei/Moses art

market index (all converted to current euros) and the SBF250 Paris Stock Market Index. The correlation with art prices seems fair, with the overall price following the market trend (while the mean price is lagging behind global art market prices). When we look at market segment separately, the correlation seems a bit different however. Hence we need to analyze more precisely the determinants of autograph prices. This is something we should do using an hedonic prices approach.







3. Estimation of Hedonic Prices

A cross section model is estimated first, then we design a pseudo panel to run a time-series approach. Final remarks about out-of-sample estimates are vindicated by events of exceptional significance.

A. Estimation on cross section

The hedonic price equation is estimated with the usual semi-logarithmic specification, which is proved to derive from utility maximizing (Ohta, Griliches, 1986)[7]. From the econometric point of view, it has been advocated for instance by Griliches (1961). For this specification, the effects of all covariates in the hedonic price model are supposed to be multiplicative, as usual in the literature: for instance, the number of page does not add to the specific effect of a given author, but multiply that specific effect. The constant in the

[7] The distribution of logarithmic prices is approximatively normal in our dataset. Atwork price data are generally highly skewed, according to Georges and Seçkin (2012), which justify to adopt a semi-logarithmic specification.

regressions, indicating each sale date, measure an exponential growth rate of the market prices between two dates:

$$\begin{aligned}\ln P = {} & a_1 + a_2*\text{Pages} + a_3*\text{type1} + a_4*\text{type2} + a_5*\text{type3} + a_6*\text{type4} \\ & + a_7*\text{c16} + a_8*\text{c17} + a_9*\text{c18} + a_{10}*\text{c19} + a_{11}*\text{cat\_art} + a_{12}*\text{cat\_scien} + a_{13}*\text{cat\_lit} \\ & + a_{14}*\text{Google} + a_{15}*\text{Google\_Fr} + a_{16}*\text{auction} + a_{17}*\text{auctsell} + a_{18}*\text{auct2} \\ & + a_{19}*\text{CPI} + a_{20}*\text{MMArt} + a_{21}*\text{SBF} + \sum_{i=22}^{122} a_i * d_{i-21} + \varepsilon\end{aligned}$$

Pages: logarithm of page count; *type1*: "set" of various documents; *type2*: autograph letters, signed autograph letters; *type3*: other letters; *type4*: manuscripts, notebooks; *type 5* (dropped): everything else, mainly small pieces, such as billet, apostile, etc.; *c16-c19*: 16th through 19th century (20th century dropped); *cat_art*: author is an artist; *cat_scien*: author is a scientist; *cat_lit*: author is a literary figure/writer/essayist; *cat_hist* (dropped): author is a historical/political figure; *Google*: logarithm of google hits (global accessed from France); *Google_Fr*: logarithm of google hits on French sites ; *Auction*: sold in auction; *auctsell*: item principally sold at auctions; *auct2*: auction *auctsell; *CPI*: logarithm of OECD CPI for France; *CPI*: logarithm of OECD CPI for France; *MMArt*: logarithm of google hits of Mei-Moses all art index converted in euros; *SBF*: logarithm of SBF250 Paris stock market index; *d*: dummies for 101 authors; *d*: dummies for101 authors.

Following Bartik's critic of Rosen approach (Bartik, 1987) in the first regression of the hedonic price function, we do not take into account the demand-supply interaction advocated by Rosen (1974). The effects of all covariates in the hedonic price model are supposed to be multiplicative, as usual in the literature: for instance, the number of page does not add to the specific effect of a given author, but multiply that specific effect. The constant in the regressions, indicating each sale date, measure an exponential growth rate of the market prices between two dates. The documents'length (page count) is taken into logarithm, so that the specification can also be written in terms of the unit price by page.The author's name or notoriety can be considered as related to the market, not as an intrinsic characteristic of the autograph. However, its addition to the vector of determinants of the hedonic price help to solve endogeneity problems due to some correlation of these two variable with other determinants: in that sense, it allows to estimate without bias the coefficients of these determinants. The value of an autograph can also be due to the rarety of its author on the market (for instance Rimbaud's autographs compared to Baudelaire). We have no measure of that rarety, except the rarety observed in our dataset, so that we leave it to be included in the estimated author's specific effect. The internet presence is measured by the number of hits obtained by Google Web Search, either international or only for France (commutatorsite:fr). As remarked by Wyburn and Roach (2012), this definition renders the quantification contemporary to the present date, and its application to sales made before is therefore disputable.

Table 4
Hedonic price Regression

	Model 1	*Model 2*	*Model 3*	*Model 4*	*Model 5*
Adj R-squared	= 0.5730	= 0.5720	= 0.5829	= 0.6741	= 0.7680
Pages	.6515081**	.6648162**	.7489758**	.6928184**	.690111**
type1	.2011413			-.5112353**	-.5769912**
type2	.3477805**			.5377708**	.4890972**
type3	.2345494**			-.0866528	-.0748886
type4	.3561248**			.6854728**	.7204952**
s16			.9371681**	1.463795**	2.276386**
s17			.7548604**	1.082984**	2.452903**
s18			.4039877**	.4886355**	.1818867
s19			.2764153**	.1208192**	.1048163
cat_art		.0250181		.0968872	1.639021**
cat_scien		.449962**		.3988156**	2.533929**
cat_lit		.1955199**		.1589948**	.4904746
auction				.0535682	-.0637395*
auctsell				.2846463**	-2.608855**
auction2				-.1725658	-.2343091**
Google				.5055497**	.6418233**
google_fr				-.3128983**	-.6260178**
CPI	.245848	.2175317	.3056152	.1977464	.2444404*
MMArt	.6552062**	.681557**	.6318992**	.6793459**	.6804593**
SBF	-.2899023**	-.3001189**	-.26686**	-.2673136**	-.2709056**
_cons	.6926517**	.8372795**	.0056278**	-2.056013**	-2.033679**

* — significant at 5% confidence level; ** — significant at 1% confidence level;

We first ran some simple regressions to answer the questions in part 1:is the price sensitive to the length of autographs (*i. e.* page count) or to their type (autographed letter, signed letter, apostil, etc.)? Is the price sensitive to the nature of the signer? Is the price sensitive to the *oldness*? All these effect are significant. We used price indices as deflators (art and stock market price indices, as wellas the CPI): the regressions prove the CPI not to be consistently significant while Mei-Moses Art Index seems robust. Comparing the model with a partial regression excluding the dummies for authors shows thatall coefficients seem quite stable, with the significativity of only CPI and the auction dummy being questionable. The authors' specific effects are significant for 32 among 101, since the century and authors category dummies take much of these individual effects. Refining the market segment analysis by introducing, together with auction dummy an "*auctsell*" dummy indicating an author more often sold at auction than in stores in the *database*. This choice appears to be significant as such authors deserve a 28% premium on their autographs. "*Auction2*" denotes when such autographs are sold at auctions: by bearing a negative sign, this dummy shows that the interaction between market segments is all but simple. It seems that sustained auction sales lead to a price premium at stores, but poor auction performance.

Another quite subtle effect is captured through fame-related variables: google hits count are measured both from a global and local variable (using *site:fr* command in google). There has been already a lot of literature about using google to measure fame in general (Schulman [2009]) and more precisely in art markets (Knebel [2007], Tekindor [2012]). The regressions here show that global fame has a strong positive impact on price but local fame adversely affects market value[8]. Some authors from the sample enjoy a mostly local recognition that does not convey a high selling price on the global art market: Georges Cadoudal, Philippe Le Bas and Alphonse Louis de Richelieu exemplify these French-only collectibles.

The explanation of autographs' prices is quite good, since the model explains more than two thirds of the variance and adding author dummies allows for a good three quarters explained variance. As discussed in section 2, the market changed after 1990, so that the estimation is reproduced before and after 1990. Comparing the two markets — stores and auctions — by a Fisher test affords, for the first regression on the whole period, a Fisher index of 5.847, greater than the 5% limit (1.79) which shows some difference between the influences of the explanatory variables for the two types of seller. Nevertheless, this difference disappears for estimation made separately for the two periods, so that we can consider that the hedonic pricing is the same for the two types of seller. Overall, prices are 20% greater at auction compared to stores, all other things equal, but this difference disappear when the model is more complex, which may show that the two markets differ in the type of author which is present on the markets, auctions selling authors which are, all things equal, more valuated in the hedonic price function.

101 authors are characterized by individual specific effects on prices, conditional to the covariates used in the hedonic equation (some coefficients are dropped when the number of occurrence of the corresponding authors is too small). For instance (see Appendix), the average price for an autograph of Marie-Antoinette, king Louis XVI's wife, is greater by 315% to its estimated hedonic price. Napoléon I autograph do not bear any over-valuation compared to the estimated price since most among his autographs bear just a signature. These authors' specific effects may be explained partially by their international and national reputation, which can be indicated by their Google notoriety (international or national). The relationship between the author's specific effect in the autograph's price and the authors' international and national reputation shows clearly some type of *substitution* between them: one unit of international notoriety (measured in logarithm) increases the autographs' prices by 66% in average, while national notoriety diminishes it by a similar amount (62%). This substitution is constant between 1960 and 2005, while it subsists in a quadratic specification: the authors' specific price increase till 10.1 for international notoriety, then decreases, while it decreases till 8.8, then increases, for national notoriety.

Indeed, some authors are sold relatively more often in auction: defining this type of author by the fact that purchases at auctions dominate purchases in stores (which shows that

[8]Varaince inflation factors (VIF) show some colinearity between these two measures of notoriety by Google intenational and Google France (or, in the regression without the authors' dummies, the general price index or the art's market price index). This multicolinearity does not impact the coefficients of the other determinants, so that we keep the two measures of notoriety the effects of which must be considered as mixed.

they are much more present at auctions, since auctions represent only 18% in the beginning of the period and 37% in the end), an author the autographs of which are more sold at auctions (variable *enchlib*) is valued by 57% more compared to the converse (59% in stores, 40% at auctions). For this special population, the hedonic price increases is not the same across author categories; this may indicate the price increase produced by the presence of international buyers[9].

Table 5
Model 4 regression results

	Model 4 Stores &auctions	*1960-1985 Stores &auctions*	*1990-2005 Stores &auctions*	*Stores 1960-2005*	*Auctions 1960-2005*
Adj R-squared	= 0.6741	= 0.5952	= 0.3882	= 0.7022	= 0.5826
lnpages	.6928184**	.7162415**	.685942**	.7156258**	.6597453**
type1	-.5112353**	-.4726113**	-.433753**	-.4466262**	-.683465**
type2	.5377708**	.4818371**	.5740996**	.5523007**	.4442687**
type3	-.0866528	-.0878045	-.0605247	-.0083626	-.2189051*
type4	.6854728**	.6987089**	.6579076**	.6181058**	.8131052**
s16	1.463795**	1.33824**	1.714403**	1.592032**	.9953978**
s17	1.082984**	1.122169**	.873548**	1.011185**	1.016054**
s18	.4886355**	.4555001**	.4600139**	.4515445**	.4250173**
s19	.1208192**	.1404316*	.1318508*	.194287**	-.1198671
cat_art	.0968872	.0005665	.2943469**	.0820106	.1754643
cat_scien	.3988156**	.4296447**	.4635233**	.2572051**	.6869141**
cat_lit	.1589948**	.0984933**	.2926984**	.0847046	.3845779**
auction	.0535682	.2175732**	-.1389878**	(dropped)	(dropped)
auctsell	.2846463**	.2090599*	.5481536**	.3085222**	.1000051
auction2	-.1725658	.1628477	-.580201**	(dropped)	(dropped)
Google	.5055497**	.511228**	.4838248**	.5260452**	.5039408**
google_fr	-.3128983**	-.3325072**	-.2696293**	-.3381435**	-.2905135**
Lnipc	.1977464	.1451065	1.310738**	.1557027	.3248212
lnmmart	.6793459**	.7746896**	1.366498**	.6874324**	.6209022**
Lnsbf	-.2673136**	-.6019461**	-.7585726**	-.183175**	-.4254338**
_cons	-2.056013**	-.5622001	-9.57648**	-2.532476**	-.9304462**

* — significant at 5% confidence level; ** — significant at 1% confidence level;

Explanatory variables are generally highly significant. The *number of pages* increases the price with an elasticity of 0.7 (quite similar to the elasticity of 0.45 found by Georges and Seçkin, 2012, for classical music manuscripts), similar in stores and at auctions (and for the two periods): the signature affords a value to the document, so that the price of a larger document is higher, but not proportionally to its length[10]. The *ancient documents* are clearly more valuated. After 1990, *autographs from artists* (and from novelists and poets) carry a relatively clearer premium than before, which may show that international buyers are more interested in this type of author. The impact of global art market is rising with time, as price elasticity rises from 0.8 up to the 80's to more than one since then, and as usual for art goods,

[9] A precise analysis should be made over each author considered as concerns its international aura.
[10]The implicit marginal price of length increases till 8 pages, then decreases.

the correlation with stock prices appears negative. This ought to be confirmed by a more thorough micro analysis using panel data.

Various technical problems in the two steps estimation of the structural model proposed by Rosen (1974) have been discussed by Brown-Rosen (1982), Epple (1987) and Bartik (1987). Our data does not contain much exogenous variables indicating the individual characteristics of the consumers and the supply side which may complement the inverse demand and supply equations in the second step: indeed only purchase periods and the type of market, in stores or through auctions, are available information in our dataset. In the second step of Rosen's hedonic model, the implicit marginal price of some determinant of the autograph' price, for instance its length, is regressed on individual characteristics of consumers. These characteristics are not informed in our dataset, but they are supposed to change through time and to differ according to the location of the transaction (stores or auctions). We thus specify the marginal values of the length (number of pages), ageandnotoriety of the autograph as linear functions of the ten transaction dates (from 1960 to 2005), the fact that the transaction was made at auctions and the category of the author (artist, scientist, historical figure, writer)[11].

Table 6 show that the marginal value of the autograph's length, which increases the hedonic price with an elasticity of 69% in average, is significantly smaller for auctions, but with a small impact, while it increases much the effect of age (Appendix 2 shows that the coefficients are not affected by dummies indicating the year of sale). Auctions increase the marginal price of the autograph's age, which is smaller after 1990, while length valuate less the autographs in the first periods (1960-65) and for the crisis year (2000). An interesting result is that the marginal price of age is greater until 1985, then decreases, which shows that historic authors may be less desired in recent years compared to years before 1985. There is another indirect evidence of the same phenomenon with the *marginal price of author categories*, which are all negative and increasing, hence the missing one ("historical figure") conversely has a decreasing implicit price.

Variations of the implicit marginal prices in auction sales compared to sales in stores tends to prove that different population structure between buyers in stores and at auctions influence the marginal effect of some important characteristics of the autographs. Therefore, the valuation of autograph can be better by considering these interactions between the characteristics of demand (as informed by the sale location and its date) and the objective characteristics of autographs in the hedonic function.

[11]Thus, the hedonic price depends on quadratic functions of these characteristics.

Table 6
Implicit marginal price of autographs' characteristics

	Length (page count)	Period (century)	International fame (google hits)	National fame (google hits .fr)	Period (century)until 1985	Period (century) after 1990
1960	-.0210189**	-.0394962	.0026044	.0005005	-	-
1965	-.0216803**	.0603323*	.0023539	.0004252	-	-
1970	-.0091767	.0012207	-.0003594	-.0000585	-	-
1975	-.0109118	-.0061105	.0041941	.0009139*	-	-
1980	(dropped)	(dropped)	(dropped)	(dropped)	-	-
1985	-.0058256	-.052019	-.0008415	-.0003353	-	-
1990	-.0202885**	-.0923106**	.0120098	.0002234	-	-
1995	-.0150865*	-.0971407**	.0071905	.0002021	-	-
2000	-.0204771**	-.1849046**	.0140796*	.0005621	-	-
2005	-.0143997*	-.1021933**	-.0095116	.0000285	-	-
Auctions	-.0082632**	.1190451**	-.0016358	.0007981**	.1025428	.0338994**
Artist	-	-	-	-	-.6360605**	-.6006688**
Scientist	-	-	-	-	-.1291579	-.1009759
Writer	-	-	-	-	-.3092906**	-.2541556**
Constant/mean effect	.9159575	.4709504	.3731604	-.2180277	.6502094	.5664722

* — significant at 5% confidence level; ** — significant at 1% confidence level;

B. Estimation on time series

A grouping of the dataset into cells defined over the size of the document (3 items), the period[12] (3 items) and the type of author (4 items) gives rise to a pseudo panel containing 36 cells over 10 years. The estimation of the same hedonic price specification in the within

[12] "Epok1" describes authors who have produced autographs before 1800 (on line 2, subcategories distinguish between sixteenth, seventeenth and eighteenth century authors); "Epok2" authors have produced autographs only between 1801 and 1900 and "Epok3" authors have been producing after 1902 (to exclude Gauguin).

dimension gives quite similar results as concerns the effect of the document's size (elasticity equal to 0.44), which shows that the estimate in the cross section dimension may not be biased by endogeneity of the explanatory variables.

Table 7
Pseudo-panel regressions

	Fixedeffects	*Between*
R-sq: within	= 0.1881	= 0.0119
between	= 0.0430	= 0.8209
overall	= 0.1035	= 0.0171
pages	.9110934*	.2000064*
auction	-.2573092	-.4415833
auctsell	-.0223303	1.451516**
auction2	.5352068	-2.323833
google	.5165178	.0810814
google_fr	-.3207358	-.0407733
mmart	.3712605**	1.260601
Sbf	-.4095355**	-2.59544
_cons	-3.029526	6.891997

* — significant at 5% confidence level; ** — significant at 1% confidence level;

C. Out of sample estimates

There is a controversy running in France since a half decade, as the market is put under stress by the aggressive marketing of a fund, which advertises autographs for their future return. This controversy provides many opportunities for out-of-sample testing as many auction sales where much advertised. One simple way to think of these natural experiments is to invert the model and look at the difference between the estimated price and actual price in a given auction: this *implied residual* is then tabulated with the residual in regression of model 4 (standard error .9318958). Our model allows for very high valuation of given autograph: for instance, the Foucault archives, as conserved by Daniel Defert, have been valued at 4-4.5 million euros by two independent experts. This would bring an *implied residual* around 1 (higher 25% of distribution, quite moderate as these archive feature 16,000 pages of unpublished manuscripts). A more extreme example is given by the famous Einstein-Besso correspondence: these 54 pages of letters were sold in 1996 for 400 k€, then for 540 k€ in 2002. While the first valuation features a 3.98 residual, which is really high (more than 4 time standard error), the second one, with 4.26 is even higher… than one would likely pay: this price point has been criticised, see e. g. Noce [2013].

Other controversial examples feature the auction sale of some Robespierre papers on May the 18th of 2011 at Sotheby's Paris. There has been an exceptional emotion among the French for it was thought that foreign speculators could buy a *trésor national* (national treasure): the very same fear was common for wheat during the Revolutionary era, but Robespierre was far from being a *trésor national* at the moment. The buzz among scholars, representatives of left-wing NGOs and even politicians led the director of the *Archives de France* to announce in advance that he would buy the autograph manuscripts, whatever the price: this early announcement has been criticized for unleashing, if not fuelling speculation. The final selling price was slightly above 900,000 euros while the experts valuated the documents between 200,000 and 300,000. While the expert's estimate would have brought a residual of 4 (very

high as the documents were advertised to change the whole interpretation of the French revolution) the finale sale price brings a good 5.48 hence close to six standard errors! Otherexamples of unbelievablyhighpricesinclude Louis XVI's*Déclaration à tous les Français* (residual 5.97) or André Breton's*Manifeste du surréalisme* (residual 6.32).

This latest examples shows that there is an asset bubble on some French autographs, as the prices of these pieces obviously deviates from their fundamental price. That this bubble is linked with the aggressive methods of new players trying to make profit of a new speculative model seem fairly obvious, although it is not our main subject. We should hence go back to characterizing France's autograph market integration into the global art market by trying to elaborate how supply answers to price movement.

4. Estimation of the Akerlof effect

The hedonic regression leads to think of residual as a measure of quality of the autograph at hand. We were then tempted to use the dataset to test market behavior. First, response of demand to unanticipated change in price is an important aspect of art market, as only sale can reveal the value of a given good. In order to assess market process efficiency, we tried to test the responsiveness of supply to the pressure of demand. In order to do so, we computed for every period the mean residual per author. The intuition was that, if the residual were positive on average, this would indicate demand pressure and would bring autographs from the same author to the market. Then we have drawn a 3x3 table with residual level in rows and demand responsiveness in lines.

Table 8

Demand response to residual, all sales

RESIDUAL SIGN /DEMAND RESPONSIVENESS	NEGATIVE RESIDUAL[13]	RESIDUAL AROUND ZERO	POSITIVE RESIDUAL
Rising supply	42	153	155
Stable supply	16	45	143
Falling supply	58	213	84

The chi-2 test for independence is significant at any level, with positive residual during a period significantly leading to a rise in supply during next period. The Akerlof effect hence appears positive for the overall market. Looking at the auctions alone, the same phenomenon is confirmed: a strong statistical significance, although there is no systematic causality.

[13] The precise point is whether mean residual for a given author is significantly above or below the mean residual for the period at hand, i. e. below $\mu-\frac{3}{4}\sigma$ between $\mu-\frac{3}{4}\sigma$ and $\mu+\frac{3}{4}\sigma$ or above $\mu+\frac{3}{4}\sigma$.

Table 9
Demand response to residual – auctions only

RESIDUAL SIGN /DEMAND RESPONSIVENESS	NEGATIVE RESIDUAL	RESIDUAL AROUND ZERO	POSITIVE RESIDUAL
Rising supply	31	150	93
Stable supply	50	108	231
Falling supply	35	153	58

Table 10
Demand response to residual – stores only

RESIDUAL SIGN /DEMAND RESPONSIVENESS	NEGATIVE RESIDUAL	RESIDUAL AROUND ZERO	POSITIVE RESIDUAL
Rising supply	41	148	130
Stable supply	18	60	77
Falling supply	57	203	75

The residual/transaction volume feedback seems not as strong with auctions as with overall sales or even with stores; moreover the market pull is clearly asymmetric, with positive residual leading to rising supply while a negative residual does not bear a very clear impact on supply. It might indicate that sellers react to short-term trends or fashion more readily than auctions sales.

Conclusion

The hedonic price corresponds to the price an autograph should be valued on the market according to its objective characteristics. Estimation of such an hedonic model for the autographs appears quite good, it may may be used to price an autograph knowing the author specific effect, its date, size and category.

The historical trend shows that autographs' prices increased recently, but over the period the increase was much smaller than the international prices for art. This international price impacts positively the autograph market, elasticity being around 0.5.A true panel of autographs prices is difficult to build because autographs are less precisely defined compared to other art pieces. The pseudo-panel approach allows comparing price evolutions for different types and age of autographs.

Finally, the main interest of the hedonic function for autograph, apart from the disaggregation of the value between its components and the possibility to compute a "normal"

price conditional to the determinants considered in the hedonic function, relies in the possibility to retrieve the intrinsic value of some particular autograph or author (its specific effect). That specific effect cannot be entirely explained by objective determinants observed on the market: sellers insist that some special event (authors jubilee or the presence on the market of specific admirer) produce noise. Nevertheless, our model shows satisfactory statistical properties. Valuing the specific effect of every author show that the strongest value goes to famous historical courtesans (du Barry, Pompadour, etc.). More generally, the specific effect is significantly correlated with fame, as measured by Google hits, with local fame playing a significantly negative role.

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Appendix
List of authors of autographs

Auteur	**International fame (google hits)**	**National fame (google hits)**	Residual	95% Confidence interval	95% Confidence interval
ALEMBERT JEAN LE ROND	1990	435	-3,078158	-4.398103	-1.758212
APOLLINAIRE GUILLAUME	1980	385	-0,7789827	-1.343947	-.2140182
BALZAC HONORE	4530	648	-0,0750996	-.6692904	.5190912
BARRY JEANNE BECU	1550	165	2,9114	1.525515	4.297285
BAUDELAIRE CHARLES	5720	676	0,0907814	-.4893059	.6708688
BEAUHARNAIS EUGENE DE	287	30,2	1,632761	.3468756	2.918646
BEAUHARNAIS JOSEPHINE DE	244	15	3,542057	2.243566	4.840548
BERLIOZ HECTOR	3220	953	-0,9368717	-2.064532	.1907882
BERRY MARIE CAROLINE DE	346	50,9	-2,180101	-2.955778	-1.404423
BERTHIER LOUIS ALEXANDRE	155	23,1	-1,892035	-2.611163	-1.172907
BLUM LEON	2430	1680	-2,457831	-3.308805	-1.606857
BOILEAU NICOLAS	391	80,2	-0,5307893	-2.080775	1.019196
BONAPARTE CAROLINE	52,9	3,87	-1,89529	-2.806381	-.9841983
BOSSUET JACQUES BENIGNE	430	103	-1,820032	-3.237939	-.4021252
BRAQUE GEORGES	1570	195	-0,9460638	-2.239657	.3475296
BUFFON GEORGES LOUIS	455	41,2	-2,621926	-3.969902	-1.273949
CADOUDAL GEORGES	122	46,6	-0,3978199	-1.382566	.5869263
CAMBACERES JEAN JACQUES DE	88,3	22,2	-2,732006	-3.493516	-1.970495
CHAISSAC GASTON	126	55,2	-1,274695	-2.472077	-.0773131
CHARLES IX	864	137	-0,0520876	-.4992584	.3950831
CHARLES X	1540	228	-1,964484	-2.723873	-1.205095
CHOISEUL ETIENNE FRANCOIS	367	56,2	-2,386772	-3.234417	-1.539127
CLAUDEL PAUL	1530	570	-1,945193	-2.515829	-1.374556
CLEMENCEAU GEORGES	1090	2920	-2,526939	-3.260242	-1.793637
COCTEAU JEAN	4480	1120	-1,881182	-2.984219	-.7781447
COLBERT JEAN BAPTISTE	781	118	-2,398102	-3.713553	-1.082651
CURIE MARIE	11800	3590	-1,728194	-3.123066	-.3333229
CURIE PIERRE	2580	1210	-0,9731971	-2.66088	.714486
CUVIER GEORGES	461	82,8	-3,790255	-5.11146	-2.46905
DANTON GEORGES JACQUES	1550	225	-0,7395862	-1.527564	.0483917
DAVID JACQUES LOUIS	1240	427	2,607662	1.27998	3.935344
DEBUSSY CLAUDE	6970	685	-0,5389445	-1.657132	.5792433
DELACROIX EUGENE	1720	1040	-1,52676	-2.656725	-.3967952
DENIS MAURICE	507	82,4	-2,519828	-3.688175	-1.351481
DESCARTES RENE	6180	736	(dropped)		
DESMOULINS CAMILLE	824	418	-0,8252225	-1.649495	-.0009498
DIDEROT DENIS	2980	594	-0,1247996	-.8666707	.6170714
DREYFUS ALFRED (AFFAIRE)	636	152	-1,628644	-2.43832	-.8189689
FLAUBERT GUSTAVE	3890	677	-0,4665643	-1.028301	.0951727
FRANCOIS I	1740	838	-0,004095	-.477093	.468903

GAUGUIN PAUL	6330	391	0,5203219	-.667505	1.708149
GAULLE CHARLES DE	4850	5980	-0,763307	-1.520975	-.0056392
GUITRY SACHA	1260	345	-2,215841	-3.323759	-1.107924
HENRI III	3550	359	-0,1976148	-.6153995	.2201699
HENRI IV	5660	2830	0,0215029	-.3806026	.4236083
HERRIOT EDOUARD	1280	1050	-3,268883	-4.141386	-2.396381
HUGO VICTOR	24600	8770	-1,280742	-1.835461	-.7260227
INGRES DOMINIQUE	788	44,2	-1,654707	-2.791019	-.5183958
LA CONDAMINE CHARLES	558	106	-3,218489	-4.591252	-1.845725
LA FONTAINE JEAN	4170	1150	-0,2651845	-1.853168	1.322799
LAMARTINE ALPHONSE	1040	140	-1,789672	-2.350191	-1.229153
LAPLACE PIERRE SIMON	802	88,7	(dropped)		
LAVOISIER ANTOINE	708	105	1,976298	.7522585	3.200337
LE BAS PHILIPPE	81,1	77,1	(dropped)		
LE CORBUSIER CHARLES EDOUARD J	4250	225	-1,314134	-2.577224	-.051044
LEBRUN CHARLES FRANCOIS	4130	2020	-3,01583	-3.921956	-2.109703
LEFEBVRE FRANCOIS JOSEPH	753	63,5	-2,03014	-2.792582	-1.267697
LOUIS XIII	4230	928	-1,797403	-3.102809	-.4919974
LOUIS XIV	11200	3750	-2,363582	-3.649238	-1.077926
LOUIS XV	8770	2740	-1,74665	-2.469131	-1.024169
LOUIS XVI	7880	2090	-1,295057	-2.006582	-.5835309
LOUIS XVIII	1810	347	-1,714357	-2.436916	-.9917977
LOUIS-PHILIPPE	538	125	-2,354922	-3.08541	-1.624435
LYAUTEY HUBERT	289	70,6	-2,919246	-3.685571	-2.152921
MARAT JEAN PAUL	505	27,1	(dropped)		
MARIE LECZINSKA	54,6	14,3	-1,088933	-1.842419	-.3354459
MARIE-AMELIE	136	29,2	-2,769698	-3.613134	-1.926263
MARIE-ANTOINETTE	17800	1130	4,151519	2.786216	5.516823
MARIE-LOUISE	1730	128	-1,310856	-2.046782	-.5749294
MATISSE HENRI	5620	482	-1,092159	-2.244252	.059935
MEDICIS CATHERINE DE	743	168	(dropped)		
MIRABEAU HONORE GABRIEL R	75,4	10,3	-1,572632	-2.315313	-.8299513
MONET CLAUDE	9330	756	2,730231	1.041236	4.419226
MURAT JOACHIM	1550	17	2,269481	.9779671	3.560994
NAPOLEON I	33600	734	-0,3124219	-1.014762	.3899179
NAPOLEON III	6790	1350	-1,77357	-2.500137	-1.047002
NECKER JACQUES	687	97,9	-2,352525	-3.106407	-1.598643
PASTEUR LOUIS	6400	1320	1,650895	.5444083	2.757381
PETAIN PHILIPPE	947	142	-1,827778	-2.596081	-1.059475
PICASSO PABLO	17900	1160	(dropped)		
POINCARE HENRI	1590	594	-4,23791	-5.647912	-2.827908
POMPADOUR JEANNE ANTOINETTE	746	44,7	3,16538	1.873393	4.457367
PROUST MARCEL	5640	548	-0,4396144	-.9872927	.1080638
RACINE JEAN	2710	581	0,2407764	-1.26267	1.744223
RAVEL MAURICE	5160	733	-0,6192895	-1.75376	.5151807
RENOIR AUGUSTE	4560	664	-0,884242	-2.030257	.2617725

RICHELIEU ALPHONSE LOUIS	107	12,9	(dropped)		
ROUSSEAU JEAN JACQUES	6710	1430	-0,4772442	-1.086924	.1324361
SAINT EXUPERY ANTOINE DE	7500	692	(dropped)		
SAINT-JUST LOUIS ANTOINE DE	947	72,1	-1,03194	-1.819435	-.2444449
SAND GEORGE	3770	877	-1,358049	-1.923412	-.7926872
SARTRE JEAN PAUL	6460	392	-1,624412	-2.202004	-1.046821
SEVIGNE MARIE DE RABUTIN MARQUISE DE	534	208	0,1396645	-1.408711	1.688041
SIGNAC PAUL	643	82,5	-1,824719	-2.964399	-.6850392
SULLY MAXIMILIEN	248	69,3	1,910573	.2765749	3.54457
TALLEYRAND CHARLES MAURICE	362	35,5	-1,559937	-2.273998	-.8458757
THIERS ADOLPHE	292	183	-3,297763	-4.122717	-2.472809
VALERY PAUL	2760	960	-1,153894	-1.707802	-.5999867
VIOLLET LE DUC EUGENE	509	166	-2,403427	-3.958141	-.8487127
VOLTAIRE FRANCOIS MARIE AROUET	967	44,7	3,989112	2.580164	5.39806
ZOLA EMILE	5900	1770	-1,451092	-2.012123	-.8900606
AYME MARCEL	171	233	X		
			-0,965139806		

Appendix 2

Implicit marginal price of autographs' characteristics featuring both year of sale dummy and author category

	Page count	Period (century)	International fame	National fame
1960	-.0237345	-.0498039	.0031069	.0006093
1965	-.0242496	.0161714	.0029874	.0004972
1970	-.0117242	-.0281749	-.0002318	-.0000599
1975	-.0166799	-.0729098	.0007842	.0005918
1980	(dropped)	(dropped)	(dropped)	(dropped)
1985	-.0068429	-.0661752	-.0003887	-.0003166
1990	-.0183854	-.0821151	.0146171	.0004273
1995	-.0158848	-.1058728	.0088239	.0004367
2000	-.0194399	-.1372472	.0147142	.0006255
2005	-.0179562	-.1411131	-.0110853	-.0001276
Auctions	-.0133573	.062654	-.0051313	.0005077
Artist	-.0273917	-.6223073	-.015735	-.0016482
Scientist	.0046315	-.1289992	-.0135179	-.0022284
Writer	-.0370993	-.2917185	-.0384543	-.0032669
Constant/mean effect	.9340069	.6851881	.3884645	-.2166429